

ABSTRACT OF THE DISCLOSURE

A hinge apparatus generally includes a hinge pin formed of a two-way shape memory alloy (SMA) adapted to transition, without an externally applied load, between a first trained shape and a second trained shape upon switching
5 the two-way SMA between a first state and a second state. The hinge pin can apply two-way reversible actuation forces to a device coupled to the hinge apparatus. The hinge pin can be produced by thermal cycling a material under a sufficient load for a sufficient number of thermal cycles between about the material's austenite and martensite temperatures to complete training of the
10 material. The thermal cycling conditions the material to transition, without an externally applied load, between an austenitic shape and a martensitic shape to perform useful work when the material is thermally cycled between the austenite and martensite temperatures.